The Prevalence and Severity of Arthritis among Older Women Farmers in Ohio

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BACKGROUND

The chronic condition of arthritis, or inflammation of the joints, describes more than 100 rheumatic diseases and conditions that affect the joints, tissues surrounding the joints and other connective tissues (U.S. Department of Agriculture, 2007). Even though arthritis not a part of normal aging, one area of work that it is especially prominent in is farming. With farming, farmers are participating in a variety of tasks anywhere from milking a cow, to moving bales of hay and straw, and the frequency of the movements involved with farming can increase an individual's chances of arthritis. Another risk factor for arthritis is age, and the average age of a farm operator is 57.1 years old; another reason why farmers are at a higher risk for arthritis. Arthritis is also more common in women. Out of all people with the condition, 60 percent are women (U.S. Department of Agriculture, 2007). This statistic is unfortunate for women farmers, because they are also found to be underserved by many service providers, including health care. Since farmers tend to live in more rural areas, they are typically less able to visit a doctor regularly and are found to have lower levels of preventative care (Hunter, Hancock, Weber & Simon, 2011).

Although men are the majority of farmers, recently there has been a large increase in the number of women farmers. In the 2007 Census of Agriculture, it was found that more than 30 percent of U.S. farm operators are women. Women farmers totaled more than one million and that number increased by 19 percent from 2002. The number of women who were principal operators of a farm also increased from 237,819 to 306,209. Although the average woman's farm size was not as large as the average male's, women still operated about 210 acres of land (U.S. Department of Agriculture, 2007).

PROJECT

Due to the recent influx of women to the farming occupation, researchers have pondered the question: Are women farmers significantly more likely to develop arthritis than men farmers? Does family history have an effect on developing arthritis? Is weight a factor in developing arthritis, especially arthritis of the knee?

LITERATURE REVIEW

Osteoarthritis (OA) is a Musculoskeletal Disorder (MSD) that occurs when the cartilage on the ends of the bones wears down (Mayo Clinic, 2012). It has often been found as a condition that many individuals try to ignore, or overlook because they feel that it is inevitable to escape this type of MSD. In an article over viewing OA, David Felson and David Hunter (2006) found that, early on in the disease, people are not aware of joint pain and mild pain does not start until considerable joint damage has happened. Dr. Peter Brooks (2002) conducted a meta-analysis of the impact of OA on individuals and society; he found that OA is the fourth most frequent predictor of health problems worldwide in women. Brooks also found that in the United States, OA is expected to grow to affect 23 million more people within the next 20 years. In the United States alone, OA is supposed to rack up a charge of $100 billion dollars by 2020 due to medical care and lost wages (p. 574).

There are many risk factors that pertain to OA including: increased age, female sex, bone deformities, joint injuries, obesity, and certain occupations (Mayo Clinic, 2012).

Increased Age

Aging is known as the most pronounced risk factor for OA, although it combines many different theories. First is the theory of continuous loading. Continuous loading is better known as the effects of wear and tear on your cartilage over time. The wear and tear over time initiates damage to the cartilage extracellular matrix which leads to a loss of function and destruction of the tissue; this causes an increased risk for OA because the cartilage is being worn down (Aigner, Rose, Martin & Buckwalter, 2004).

The second theory related to the risk factor of aging is the changes that occur in the collagen network of the cartilage itself. As one ages, the covalent cross-linking of single collagen chains increases which causes the fibers of the extracellular matrix to become more rigid and less flexible in joint loading and movement. This leads to resistance to compression over time (Aigner, Rose, Martin & Buckwalter, 2004).

A third theory is the increase of glycation end products, or non-enzymatic protein modifications. Aigner, Rose, Martin and Buckwalter (2004) note, "The accumulation of non-enzymatic protein modifications has been shown to increase the stiffness of the collagen network" (p. 135-136). When there is an increase of glycation end products in the articular cartilage, the effect can mean a decrease in the synthesis of collagens (Aigner, Rose, Martin & Buckwalter (2004).

Female Sex

In a study published in BONE, Official Journal of the International Bone and Mineral Society, 58% of women had symptoms of OA of knees before the age of 50 compared to a substantially lower 20% of men (Szoeke, Cicuttini, Guthrie, Clark & Dennerstein, 2006). This

same study also found evidence linking the age period of developing OA to menopause. Szoeke, Cicuttini, Guthrie, Clark and Dennerstien noted, "64% of females with OA of knees had the onset of symptoms either perimenopausally, or within five years of natural menopause or hysterectomy." In a study published in Joint Bone Spine, the study concluded that Hormone Replacement Therapy for the symptoms of menopause may lower the incidence and progression of hip and knee OA (Richette, Corvol & Bardin, 2003).

Joint Injuries and Bone Deformities

OA is very closely linked to joint injuries because OA includes end-stage joint damage. Damage in joints occurs when the protection mechanisms in the joints fail (Felson, 2004). Dr. David Felson explains that, "The local articular systems protecting cartilage from injury during daily activities consist of muscles and tendons, ligaments and joint capsule, and mechanoreceptors. Joint loads are anticipated, with muscles and tendons assuming the correct tension and position to deflect those loads, distribute them across the whole joint surface, or lessen the rate with which the load is applied to the joint" (p. S16). Dr. Felson then shares that when joint damage occurs, the muscles, tendons, ligaments, joint capsules and mechanoreceptors are unable to protect the cartilage from the load that is placed on it. This leads to joint vulnerability which can turn into OA if the vulnerable joint or joints are used repetitively.

In a meta-analysis performed by Alison Stewart and Alison Black (2002), it was found that spinal, hip and knee OA are linked with higher rates of Bone Mineral Density (BMD). The meta-analysis also discovered that just because OA patients have a higher BMD, it does not protect them from experiencing a fracture, which can be mediated through the increased risk of falls. Researchers, Marco Cimmino and Massimiliano Parodi (2004), write that, "Increased bone

density in the subchondral area (area below the cartilage) could induce bone stiffness and accelerate cartilage destruction" (p. 31).

Obesity

Being overweight increases the amount of force across a weight-bearing joint and therefore ups the risk for OA. In an article by Dr. MaryFran Sowers (2001), studying the epidemiology of the risk factors related to OA, she found obesity to be a strong contender contributing to OA and that obesity plays more of a role on increasing the prevalence of OA in women than men. Dr. Sowers reports, "Prospective data on women suggest that the risk for knee OA is increased by approximately 15% for each additional kg/m² of body mass index above 27" (p. 448.) Michael Nevitt and Nancy Lane (1999) have found that "obesity is the number one preventable cause of knee osteoarthritis in women and ranks second in men after knee injury" (p.633).

Occupational Risks

In a cross sectional survey assessing the severity of one's arthritis compared to their occupation, it was found that cleaners, construction, mechanical and clothing workers, and agricultural workers were the top three occupations to cause an increased risk for developing OA. These three occupations were found to be the top three found in both men and women. The top risk factors associated with these occupations were lifting and carrying heavy objects, uncomfortable position of the joint, working with a vibrating vehicle or tools, regularly repeating the same movements and working at a pace set by a machine (Rossignol, Leclerc, Allaert, et al, 2005).

In a study describing the burden of major MSDs performed by Anthony Woolf and Bruce Pfleger (2003) from the World Health Organization (WHO), research indicated that agricultural work produced the largest risk for OA. This could be due to the repetitive and strenuous work involved with farming that can vary anywhere from harvesting crops to milking cows.

In a conference titled Arthritis, Agriculture and Rural Life: State of the Art Research Practices and Applications held by the National AgriAbility project and The Arthritis Foundation, Indiana Affiliate (Cook & Field 2012), the focus was to address the issue of arthritis in agriculture. The big problem that the conference stressed was that too often people worry about high blood pressure and bad cholesterol, but seem to forget about arthritis. The conference stated that nearly one in three active farmers have a type of arthritis! Cook and Field (2012), also explained how farmers put their aches and pains on the backburner since the chores have to be completed day in and day out. That leads unreported cases of MSDs in the farming community.

The ergonomic risks found in farming are explained more thoroughly by Dr. Kermit Davis and Susan Kotowski (2007) in the *American Journal of Industrial Medicine.* They performed an evaluation on peer-reviewed publications that were dated before December 2006. The purpose of their review was to increase understanding of MSDs and injuries in farming, as well as researching what has been done to reduce the risk factors. The injuries related to farming were found to increase as hours worked increased, a statistic of a 3% increase for every hour worked. Injuries included lacerations, fractures, internal bleeding, kicks, bites and falls from farm animals, falls from tractors and machinery, rollovers and other accidental injuries (p. 502). Davis and Kotowski (2007) found that aside from the multiple injury risks, farming is one of the most hazardous occupations in the United States, due to the repetitive forceful work and bending

(p. 504, 507). The evaluation used their peer review to determine that farmers' injuries are too often underreported because only 4-10% of farms in the US are required to report their injuries. This lack of declaration is because those farms employ less than 11 people (Davis & Kotowski, 2007, p. 502). The injuries that they found were caused by carrying totes or bins fully loaded in the fields, often having high stresses in the low back due to awkward postures with severe flexion or stooping occurring; for example; when picking apples or transporting plants (Davis & Kotowski, 2007, p. 506).

Kirkhorn, Earle-Richardson and Banks (2012), sought to look further into the current research for solutions to the MSDs in agriculture. What they found to be the most effective technique is adequate time for the affected area of the body to recover, but it is a challenge because farmers are not easily able to take off work and usually do not have sufficient health care coverage. They found that interventions are often difficult to implement because the built environment is minimal since most agricultural activities are performed outdoors; if there is an opportunity to implement change, the cost is usually very high. Kirkhorn, Earle-Richardson and Banks found the most successful technique is to engineer or 'design out' the hazard by physically modifying materials, methods, tools or machinery. The changes to alleviate MSDs can occur at either the farm level, individual level or both. For example, farm level changes can require a 5 minute rest break for every hour of repetitive labor. An individual level change is the least costly and would require doing something such as modifying equipment in order to better suit one's body. Researchers stated that another critically important step to reduce MSDs is rigorously evaluating the effectiveness of new interventions (p. 286).

As stated earlier, the female gender has an increased risk for MSDs and arthritis. Worldwide estimates conducted by the WHO have shown that 18% of women have OA

compared to 9.6% of men over 60 years of age. The WHO report also found that in studies of US and European populations over 45 years old show increased rates for OA of the knee: 14% for men compared to 22.8% for women (Woolf & Pfleger, 2003). These findings of the female inclination to arthritis are also backed by a population based control study performed in Sweden by Holmberg, Thelin and Thelin (2004). The study was conducted to evaluate the occupational workload effects on OA. Data from the Statistics Sweden website shows that agriculture in Sweden consists of animal products, horticulture, grain products, cereals, potatoes, grasses and organic farming, and the researchers found that women who had worked for 11-30 years in farming tended to have an increased risk for OA. The findings also showed that farm work combined with excess weight increased the risk for knee OA. Men were found to have a 3.1 % increase while women had a 4.4 % increase (Holmberg, Thelin & Thelin, 2004, p. 347).

Keeping the focus on knee arthritis, a case reference study, published in *The Scandinavian Journal of Work, Environment and Health,* was conducted on men and women aged 55-75 to examine the impact of physical workload on the risk of severe knee OA. Physical workload seemed to increase the risk of knee OA for both genders. For women, a high physical workload and kneeling and squatting for over two hours or more per day had the highest incidence to contribute to knee OA. The study concluded that in the aspects of occupation, farming, fishing and forestry among women showed association with the risk of knee OA (Manninen, Heliövaara, Riihimäki & Suomalainen, 2002, p. 31).

As the research has stated, women have a greater risk for arthritis, especially of the knee, than men when they are farming and have excess weight. These findings will be compared with the research project, Farming with Arthritis, to see if the data on women farmers shows the same

results in the increased amount of knee OA. We will also compare the data we have on those farmers' reports of visiting the doctor and reporting those issues of MSDs.

METHODOLOGY

To answer our questions, an ongoing research project that has been accepted by the IRB, approval number: 2010HO177 is being studied. The Farming with Arthritis project was started in June 2010 and is on-going. It is being conducted by Ohio State faculty and students of the Occupational Therapy Program and the Health Sciences major along with 22 Extension educators from Ohio State Extension offices. The data was collected through a specially-designed questionnaire, The Arthritis Screening Survey for Farmers (see attached). The questionnaire was developed with the help of an older farmer and an Ohio AgrAbility staff member to identify specific farming tasks. The questionnaire was then answered by farmers, aged 50 to 80 years, who were screened at various 4-H events, county fairs, pesticide trainings, agricultural field days and other agricultural events here in Ohio. At the 4-H events, pesticide trainings and agricultural field days and events, researchers set up a booth and recruited the attending farmers to participate in our study. Researchers took a bit of a different approach to the county fairs by visiting two days instead of one. To bring attention to the project at these fairs, the screenings were advertised in the daily calendar and over the loud speaker.

The Arthritis Screening Survey for Farmers consisted of 39 questions: 12 concerning contributing factors such as age and weight, 10 questions evaluating daily functions, and six questions relating to warning signs of arthritis. The remaining nine questions gathered demographic information. The point range for the questionnaire was 0-97. A score of 0-20 deemed a low risk for arthritis, 21-77 showed some risk for arthritis, and a score of 77-97 declared a high risk for arthritis. After the scores were tallied, those who reported problems of

arthritis were notified of their risk and asked if they would like to have a short fitness screening. The fitness screening checked balance, strength and flexibility. After the questionnaire, farmers were given follow-up materials to assist them in coping with their arthritis.

In order to access and answer our research questions, the total sample was examined. The sample consisted of 302 farmers, with 108 being women. From the sample of Ohio women, researchers are going to look at their age, health, arthritis status, and if the women are overweight or not. This will help evaluate their overall health, as well as noting the prevalence of arthritis among men and women.

ANALYSIS

A chi-squared analysis test was used to compare the results of the arthritis screenings in the farmers based on their gender, health status, whether they thought they had arthritis, whether they had been told they had arthritis, and whether they were overweight and had family history of arthritis.

RESULTS

Farming with Arthritis is an IRB approved research project conducted through The Ohio State University to provide arthritis screenings for farmers and to raise awareness of arthritis prevention and management. Among the research questions that the researchers also wanted to address were 1) if those who are farming have an increased risk to develop arthritis compared to other older adults, 2) if women farmers are more likely to develop arthritis of the knee than men and 3) the relationship of being overweight and having family history to developing arthritis. The data was collected through an arthritis screening survey for farmers developed by OSU staff. The surveys were distributed by trained students under the supervision of Ohio State faculty and Extension educators, at county fairs, the Ohio State Fair, pesticide trainings and the Farm

Science Review from summer 2010 to spring 2011. In this time, data was collected from a total of 374 people. Of those 374 individuals, 302 were farmers and all respondents were between the ages of 50-80 years old. The number of women farmers in the study was 108 and the number of men farmers was 194.

Respondents were asked: Do you think you have arthritis? From this question, 300 farmers reported that they believed they had arthritis totaling 67% of all surveyed farmers. Seventy-eight percent of the women farmers surveyed believed that they have arthritis compared to only 60.6% of men (Table 1). Data was missing from two surveys thus we have 300, not 302 responses.

Do you think you have arthritis? N=300			
	Yes	No	Total
Women	85 (78.7%)	23 (21.3%)	108 (100%)
Men	117 (60.6%)	75 (38.9%)	193 (100%)
Total	202 (67.1%)	98 (32.6%)	300 (100%)

Pearson Chi-Square=10.495 P =.005

Table 1. Farmers Who Believe That They Have Arthritis by Gender.

This finding is significant to show that women are more likely to believe that they have arthritis than men.

Based on the fact that the majority of men and women farmers believe that they have arthritis, the researchers asked all of the participants if they had been told by a health care professional that they have arthritis

The total participants in our survey who had been told by a medical professional that they have arthritis was 144 or 47.1% of the total number surveyed. Women were found more likely to be told that they have arthritis: 56.4% compared to 41.8% of men (Table 2).

Have you ever been told that you have arthritis by a health care professional? N=306			
	Yes	No	Total
Females	62 (56.4%)	48 (43.6%)	110 (100%)
Males	82 (41.8%)	114 (58.2%)	196 (100%)
Total	144 (47.1%)	162 (52.9%)	306 (100%)

Chi-Square= 5.968 P=0.15

Table 2. Participants Who Have Been Told By a Medical Professional That They Have Arthritis by Gender.

This finding is not significant, but it does show a strong division between men and women who farm.

Respondents were specifically asked about pain in their knees and whether it hindered their daily activities; a total of 196 farmers reported knee pain for a total of 66% of those surveyed. Not only were women more likely to be told that they had arthritis, the data also showed that women were more likely to report knee pain than men. Seventy-one percent of women report this compared to 63.2% of men (Table 3).

Has bodily pain from your knees hindered your daily activities? N=297			
	Yes	No	Total
Females	76 (71%)	31 (29%)	107 (100%)
Males	120 (63.2%)	70 (36.8%)	190 (100%)
Total	196 (66%)	101 (34%)	297 (100%)

Chi-Square=1.889 P=.169

Table 3. Farmers Who Report Knee Pain by Gender.

Women are more likely than men to report knee pain that has hindered their daily activities, but the findings are not significant.

Contributors to Arthritis

From the Farming with Arthritis data, it appears that arthritis in farmers is closely related to family history of arthritis and being overweight. From those surveyed, 65.6% reported that they had a family history of arthritis. From the data collected, specifically among those who are

farming, 72.2% of those experiencing arthritis reported that they have a family history of arthritis (Table 4).

As far as you know, do you have a family history of arthritis? N=176			
	Yes knee pain	No knee pain	Total
Yes, family history of arthritis.	127 (72.2%)	49 (27.8%)	176 (100%)
No, family history of arthritis.	62 (55.4%)	50 (44.6%)	112 (100%)
Total	189 (65.6%)	99 (34.4%)	288 (100%)

Chi-Square=8.565 P=.003

Table 4. Farmers with Knee Pain and Who Have a Family History of Arthritis.

This finding is significant and shows that family history may be a contributor to arthritis.

The data also shows that 76.5% of the farmers reported that they were overweight (Table 5). To determine these values, the participants were asked 'Are you overweight?' with the categories for answering: 1) no, 2) yes, 1-9lbs, 3) yes, 10-19lbs, 4) yes, 20-29lbs and 5) yes, 30+lbs. Participants were not placed on a scale for exact weight values. The findings were based on their opinions. When the results were collected, the data was put into two categories: not overweight and overweight, regardless of how many pounds they reported.

Are you overweight? N=302			
	Yes	No	Total
Females	86 (79.6%)	22 (20.4%)	108 (100%)
Males	145 (74.7%)	49(25.3%)	194 (100%)
Total	231 (76.5%)	71 (23.5%)	302 (100%)

Chi-Square=.922 P-Value=.337

Table 5. Farmers Who Reported That They Are Overweight by Gender.

Out of the farming participants who reported that they are overweight, we found that women are more likely to report that they are overweight: 79.6% of women reported being

overweight compared to 74.7% of men (Table 5). For those farmers who reported that they are overweight, 72.6% reported that they experienced knee pain as well (Table 6).

Farmers who experience knee pain and report being overweight. N=291			
	Yes, knee pain	No, do not have knee pain	Total
Overweight	162 (72.6%)	61 (27.4%)	223 (100%)
Not overweight	30 (44.1%)	38 (55.9%)	68 (100%)
Total	192 (66%)	99 (34%)	291 (100%)

Chi-Square=18.984 P-Value=.000

Table 6. Farmers Who Report Being Overweight with Knee Pain.

This is a significant finding and shows that those who report being overweight are more likely to have knee pain.

After another review of the data, the increased risks for arthritis due to family history or increased weight were further confirmed. This analysis looked at those who have been told they have arthritis and compared their weight and their family history. Data on their weight can be seen in Table 7 and data from their family history can be seen in Table 8.

Farmers who have been told that they have arthritis and report being overweight. N=145			
	Yes, told they have arthritis	No, not told they have arthritis	Total
Overweight	118 (81.4%)	120 (68.6)	238(74.4%)
Not overweight	27 (18.6%)	55 (31.4%)	82 (25.6%)
Total	145 (100%)	175 (100%)	320 (100%)

Chi-Square= 6.825 P-Value=.009

Table 7. Farmers Who Report Being Overweight and who have had a Health Care Professional Tell Them That They Have Arthritis.

Farmers who have been told that they have arthritis and have a family history of arthritis. N=145			
	Yes, told they have arthritis	No, not told they have arthritis	Total
Family History	103 (52.6%)	42 (33.9%)	145 (100%)
Do not have family history	93 (47.4%)	82 (66.1%)	175 (100%)
Total	196 (61.3%)	124 (100%)	320 (100%)

Chi-Square=10.695 P-Value=.001

Table 8. Farmers Who Have a Family History of Arthritis and a Health Care Professional has told them that They Have Arthritis.

DISCUSSION

Based on the results, Table 1 confirms that arthritis should be a major health concern for farmers. A total of 202 farmers, or 67.1% of those surveyed believed that they had arthritis. Out of the farmers surveyed, women were more likely to report that they think they have arthritis. From the women in our survey, 78.7% reported that they think they have arthritis compared to only 60.6% of the men studied. The farmers in the study were also asked if they had been told by a medical professional that they have arthritis. The results of Table 2 show that just under the majority, or 47.1% of farmers had been told that they have arthritis by a medical professional. Women were more likely to be told that they have arthritis by a medical professional, totaling 56.4%, compared to 41.8% of men. These results show that women are not only more likely to think that they have arthritis, but they are also more likely to be told by a medical professional that they have it.

One suggestion for this wide difference between men and women might be the frequency of contacts with healthcare professionals. Men are less likely to go to the doctor than women. According to the U.S. Department of Health and Human Services (2012), women are more likely to report health problems and to visit a doctor or medical professional more regularly than men.

The findings from the Farming with Arthritis research suggest that the majority of farmers are experiencing knee pain that hinders their daily activities, but it appears that they are not visiting the medical professionals frequently enough to be able to properly manage their arthritis problems. It appears that since women have been told they have arthritis more frequently than men it may be they visit the doctor more frequently. Data from the National Health Interview Survey confirms this stating that only 13% of women did not visit a medical professional in the past year compared to 26% of men. The survey also found that men were more likely to have last talked to a doctor a year or more ago, or never contacted a doctor, than women (U.S. Department of Health and Human Services, 2012).

Participants were asked: has bodily pain from your knees hindered your daily activities? Table 3 shows that out of the 297 surveyed, 66% reported that knee pain has hindered their daily activities. Women reported that the knee pain hindered their daily activity more so than men, with 71% of women experiencing knee pain compared to only 63.2% of men. While this was not significant, it does show a trend that women farmers are more likely to have knee pain. Knee pain may be caused by the repetitious motions of farming such as: jumping in and out of tractors, picking fruits and bending over to pick up bales of hay and straw.

Research from the CDC in 2013 identified that there are two main contributors to arthritis: being overweight and family history. The majority (76.5%) of farmers from the Farming with Arthritis survey reported that they were overweight, and women were slightly more likely to report that they were overweight (79.6%) than were men (74.7%). Although these findings from Table 5 were not statistically significant, previous research on the population in general shows that arthritis may be related to weight. A publication from the CDC, the Morbidity and Mortality Weekly Report (2011), states that obesity is often present with arthritis,

writing that, "Arthritis affected 35.6% of adults with obesity." Although in the Farming with Arthritis project, participants were asked if they were overweight and obesity is only part of the overweight group.

Of the farmers that have been told that they have arthritis by a medical professional, 81.4% of them also stated that they were overweight. Out of those farmers who report being overweight, 72.6% of them reported that they also experienced knee pain. Only 44.1% of those who are not overweight report that they experience knee pain. The results for this were statistically significant; this suggests that being overweight is a contributor to developing arthritis of the knee.

Research from the CDC (2013), shows that family history may also be an important predictor to arthritis. The majority of the farmers in this study who report that they have been told they have arthritis also reported having a family history of arthritis, with 52.6% reporting that arthritis runs in their family. This finding is significant, and suggests that a family history is also a contributor to arthritis among these farmers. When participants were asked about a family history of arthritis pain, 72.2% reported that they did have a family history of it.

Limitations: This data helps us to better understand the risks of arthritis among farmers, but it is limited by the specific questions on the survey and how the survey was administered. For example, in the Farming with Arthritis survey, participants were not weighed on a scale in order to measure their exact weight and then evaluate their BMI (Body Mass Index), nor were x-rays used to confirm that they did in fact have arthritis. The survey relied on the reports from the participants, not a medical professional or a medical record. The Farming with Arthritis project did not use a random sample of farmers; instead the participants were approached at the county

events and community events and asked to participate in the survey. So only farmers who were healthy enough and who had interest or time to visit a county or state fair, farm science review or pesticide training and who volunteered were surveyed. Other limitations are that those who were frail probably were not included in the surveys.

Implications for practice: Based on these results, it would be beneficial to look for ways to focus on both prevention and management of arthritis for farmers. It is hard for farmers to make time to visit a medical professional, so maybe the medical professionals could come to the farmers, or have more flexible hours to tailor to their busy schedules. Another useful strategy would be to reach out to Extension offices to offer information on arthritis such as exercises that will help alleviate pain and provide information on the pharmaceutical treatments available. As a future occupational therapist, one could say that getting more education out to the farmers about arthritis and simple things that farmers can do to help prevent or manage it would be useful. These strategies include: using heating pads or ice packs, assistive devices like walkers and canes, exercise and tool modifications. Swimming and water aerobics are also excellent activities to help keep joints flexible while reducing the stress on joints (Mayo Clinic, 2012).

In a report on the 2011 conference 'Arthritis, Agriculture, and Rural Life: State of the Art Research, Practices and Applications,' speakers stressed strategic design of tools to decrease bodily harm. Cook and Field (2012) stated, "That the grip size should match the size of the circle made by the user's thumb and index finger when the tips touch. The grip should have a ridge for the thumb and handles should be long enough to decrease need to bend or kneel when possible" (p. 316). Simple things such as reducing the strain when using grips and ways to modify jumping in and out of tractors could be things to make known to farmers. The 'Arthritis, Agriculture, and Rural Life: State of the Art Research, Practices and Applications' conference

had a lower than expected attendance rate, leading their planning committee to believe that arthritis is a problem that is not well understood (Cook & Field, 2012). For those farmers that do understand, or know that they have arthritis, Cook and Field (2012) explained that, "farmers in particular tend to seek a quick solution and go on with their work, often ignoring the warning signs of arthritis, or even contributing to early onset with unsafe work practices (p. 312)."

Since farmers tend to ignore the warning signs of arthritis, occupational therapists and physical therapists could team up with doctors in farming communities and hold meetings about arthritis presenting tips and ways to manage it. These meetings should be at times when farmers are most likely able to participate, for example, in the slower months of farming to increase the number of farmers in attendance. In addition, occupational and physical therapists could also team up with FFA chapters to reach out to the younger population of farmers in order to help expand their knowledge of arthritis and the risks associated with it sooner. The sooner that the future farmers know about the risks of arthritis, the better the chances that they will take steps to decrease their risks for harm and know what warning signs to look for in the future.

Education about weight management could also be provided for farmers, since being overweight is a contributor to arthritis and the majority of farmers who reported issues with arthritis were overweight. Weight management would also be a great option because it is something that can be altered in order to improve the symptoms of arthritis, unlike family history.

Future Research: Future research should focus on the risk factors and contributors of arthritis. To do this, participants should be asked to have a physical in order to verify that they do in fact have arthritis, or choose to perform the additional fitness test included in the survey.

Researchers should reach out to the farmers; an approach to this could be teaming up with medical professionals and talking to farmers within a health care system in order to increase privacy and to verify if they have arthritis.

Research could also look into the tool modifications noted by Cook and Field (2012) to determine what different types of tool modifications there are and whether or not they helped with managing arthritis and reducing pain.

Along with researching knee arthritis, the contributors and risk factors and tool modifications, another area to look into is hand and wrist arthritis in women farmers. Other research suggests that this, like knee arthritis, is also a more common problem for women than men. Davis and Kotowski (2007) have associated hand and wrist problems with dairy farmers, finding that 51% of female dairy farmers experienced an injury in this area (p. 506). For future Farming with Arthritis research, this could be explored by taking a closer look into what types of farming have the most arthritis associated with it.

CONCLUSION

The purpose of the Farming with Arthritis project was to determine how severe the condition of arthritis is in those who are farming. Through the research, it was found that being overweight and having a family history are large contributors to developing arthritis, and farmers have a very high chance for developing arthritis. Of those farmers, women are more likely to report problems with it. Since the number of women in the profession of farming is increasing, it is especially important to develop more knowledge on why women farmers are more likely to develop arthritis and strategies to help women manage it better since it is not a part of normal aging.

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